1D Bar Codes

Note that there can be small differences between emulations in the size of bar codes, so if the emulation you are using does not give the expected results, try another emulation.

Figure 1   Abbreviations used within the bar code description tables

AIM USS	Automatic Identification Manufacturers Uniform Symbol Specification
BCD1	Entries marked with BCD1 are a part of the BCD1 Subset of the full capabilities of the BCOCA architecture, which specifies the minimum support required of all BCOCA receivers
BSA data	Bar Code Symbol Data
EAN	European Article Numbering
HRI	Human Readable Interpretation
JAN	Japanese Article Numbering
MSI	MSI Data Corporation
POSTNET	POSTal Numeric Encoding Technique (United States Postal Service)
RM4SCC	Royal Mail 4 State Customer Code – also used for a Dutch modification
UPC	Universal Product Code (United States)
UPC/CGPC	Universal Product Code (United States) and the Canadian Grocery Product Code
USPS Four-State	United States Postal Service Four-State bar code (also called OneCode[SOLUTION] bar code)

For additional information, please consult the latest edition of IBM publication S544-3766 "Bar Code Object Content Architecture (BCOCA) Reference ".

Figure 2   Bar code descriptions

Column Labels:

Type

= Value for Bar Code Type (Bar Code Symbol Descriptor Byte 12; Bar Code Data Descriptor Byte 16)

Mod = Modifier Value (Bar Code Symbol Descriptor Byte 13; Bar code Data Descriptor Byte 17)

Type	Bar Code Type	Mod	Description
X'01'	Code 3 of 9, AIM USS-39 (BCD1)		The Standard Code 3 of 9 character set and Extended Code 3 of 9 character set are supported. Also known as Code 39.
		X'01'	Print the bar code without a printer generated check digit.
		X'02'	Generate check digit and print it with the bar code.

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Type	Bar Code Type	Mod	Description
X'02'	MSI (modified Plessey code) (BCD1)	X'01'	Print the bar code with no printer generated check digits.
		X'02'	Print the bar code with a generated IBM modulo-10 check digit, which will be the second check digit (at end of data). The first check digit is the last byte of the BSA data. -------- --- All of the following variants print the bar code with two check digits.
		X'03'	Both check digits are generated using the IBM modulo-10 algorithm.
		X'04'	The first check digit is generated using the NCR modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals the remainder; error (exception condition EC-0E00) exists if the first check-digit calculation results in a value of 10.
		X'05'	The first check digit is generated using the IBM-modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals the remainder; error (exception condition EC-0E00) exists if the first check-digit calculation results in a value of 10.
		X'06'	The first check digit is generated using the NCR-modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder. A first check digit value of 10 is assigned the value zero.
		X'07'	The first check digit is generated using the IBM-modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder. A first check digit value of 10 is assigned the value zero.
		X'08'	The first check digit is generated using the NCR-modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; error (exception condition EC-0E00) exists if the first check-digit calculation results in a value of 10.
		X'09'	The first check digit is generated using the IBM-modulo-11 algorithm, the second using the IBM modulo-10 algorithm. The first check digit equals 11 minus the remainder; error (exception condition EC-0E00) exists if the first check-digit calculation results in a value of 10.
X'03'	UPC/CGPC Version A (BCD1)	X'00'	Print the standard UPC-A bar code with a generated check digit. The data to be encoded consists of eleven digits. The first digit is the number-system digit; the next 10 digits are the article number.
X'05'	UPC/CGPC Version E (BCD1)	X'00'	Print a UPC-E bar code symbol. Of the 10 input digits, six digits are encoded. The check digit is generated using all 10 input data digits. The check digit is not encoded; it is used only to assign odd or even parity to the six encoded digits.

Type	Bar Code Type	Mod	Description
X'06'	UPC 2-Character (2-Digit) Supplemental (Periodicals) (BCD1)	X'00'	Print a UPC two-digit supplemental bar code symbol (bar/space pattern and HRI). This option assumes that the base UPC Version A or E symbol is presented as a separate bar code object. The bar and space patterns used for the two supplemental digits are left-odd or left-even parity, with the parity determined by the digit combination.
		X'01'	The two-digit UPC supplemental bar code symbol is preceded by a UPC Version A, Number System 0, bar code symbol. The bar code object contains both the UPC Version A symbol and the two-digit supplemental symbol. The input data consists of the number system digit, the ten-digit article number, and the two supplement digits, in that order. A check digit is generated for the UPC Version A symbol. The two-digit supplemental bar code is presented after the UPC Version A symbol using left-hand odd and even parity as determined by the two supplemental digits.
		X'02'	The two-digit UPC supplemental bar code symbol is preceded by a UPC Version E symbol. The bar code object contains both the UPC Version E symbol and the two-digit supplemental symbol. The input data consists of the ten-digit article number and the two supplemental digits. The bar code object processor generates the six-digit UPC Version E symbol and a check digit. The check digit is used to determine the parity pattern of the six-digit Version E symbol. The two-digit supplemental bar code symbol is presented after the Version E symbol using left-hand odd and even parity as determined by the two digits.

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Type	Bar Code Type	Mod	Description
X'07'	UPC 5-Character Supplemental (Paperbacks) (BCD1)	X'00'	Print the UPC five-digit supplemental bar code symbol (bar/space pattern and HRI). This option assumes that the base UPC Version A or E symbol is presented as a separate bar code object. A check digit is generated from the five supplemental digits and is used to assign the left-odd and left-even parity of the five-digit supplemental bar code. The supplemental check digit is not encoded or interpreted.
		X'01'	The five-digit UPC supplemental bar code symbol is preceded by a UPC Version A, Number System 0, bar code symbol. The bar code object contains both the UPC Version A symbol and the five-digit supplemental symbol. The input data consists of the number system digit, the ten-digit article number, and the five supplement digits, in that order. A check digit is generated for the UPC Version A symbol. A second check digit is generated from the five supplement digits. It is used to assign the left-hand odd and even parity of the five-digit supplemental bar code symbol. The supplement check digit is not encoded or interpreted.
		X'02'	The five-digit UPC supplemental bar code symbol is preceded by a UPC Version E symbol. The bar code object contains both the UPC Version E symbol and the five-digit supplemental symbol. The input data consists of the ten-digit article number and the five-digit supplemental data. The bar code object processor generates the six-digit UPC Version E symbol and check digit. The check digit is used to determine the parity pattern of the Version E symbol. The five-digit supplemental bar code symbol is presented after the Version E symbol. A second check digit is calculated for the five-digit supplemental data and is used to assign the left-hand odd and even parity. The supplement check digit is not encoded or interpreted.
X'08'	EAN-8 (includes JAN Short) (BCD1)	X'00'	Print an EAN-8 bar code symbol. The input variable data is 7 digits (2 flag and 5 article ID digits). All seven digits are encoded along with a generated check digit.
X'09'	EAN-13 (includes JAN Standard) (BCD1)	X'00'	Print an EAN-13 bar code symbol. The input variable data is 12 digits (2 flag and 10 article ID digits).
X'0A'	Industrial 2 of 5	X'01'	Print the bar code without a printer generated check digit.
		X'02'	Generate check digit and print it with the bar code.
X'0B'	Matrix 2 of 5	X'01'	Print the bar code without a printer generated check digit.
		X'02'	Generate check digit and print it with the bar code.
X'0C'	Interleaved 2 of 5, AIM USS-I 2/5 (BCD1)		The Interleaved 2 of 5 symbology requires an even number of digits, and the printer will add a leading zero if necessary to meet this requirement.
		X'01'	Print the bar code without a printer generated check digit.
		X'02'	Generate check digit and print it with the bar code.

Type	Bar Code Type	Mod	Description
X'0D'	Codabar, 2 of 7 AIM USS-Codabar		The input data consists of a start character, digits to be encoded, and a stop character.
		X'01'	Print the bar code without a printer generated check digit.
		X'02'	Generate check digit and print it with the bar code.
X'11'	Code 128, AIM USS-128	X'01'	Print a Code 128 bar code using subset A, B, or C as appropriate to produce the shortest possible bar code from the given data. The Code 128 page (CPGID = 1303, GCSGID = 1454) is used to interpret the bar code symbol data.
		X'02'	Generate check digit and print with bar code.
		X'03'	Generate EAN 128-compatible bar code. This modifier is functionally identical to modifier X'02'.
		X'04'	Generate a UCC/EAN 128-compatible bar code, as in modifier X'03', but use parenthesis in the HRI to distinguish each application identifier. The printer inserts the parentheses in the printed HRI when modifier X'04' is specified; these parentheses are not part of the input data
X'16'	EAN 2 Digit Add-on (Supplemental) (BCD1)	X'00'	Print the EAN 2-digit supplemental bar code add-on (bar/space pattern and HRI).This option assumes that the base EAN-13 symbol is presented as a separate bar code object. The value of the two digit supplemental data determines their bar and space patterns chosen from number sets A and B.
		X'01'	The two-digit supplemental bar code symbol is preceded by a normal EAN-13 bar code symbol. The bar code object contains both the EAN-13 symbol and the two-digit supplemental symbol. The two-digit supplemental bar code is presented after the EAN-13 symbol using left hand odd and even parity as determined by the two supplemental digits chosen from number sets A and B.
X'17'	EAN 5 Digit Add-on (Supplemental) (BCD1)	X'00'	Print the EAN 5-digit supplemental bar code (bar/space pattern and HRI). This option assumes that the base EAN-13 symbol is presented as a separate bar code object. A check digit is calculated from the five supplemental digits. The check digit is also used to assign the bar and space patterns from number sets A and B for the five supplemental digits. The check digit is not encoded or interpreted.
		X'01'	The five-digit supplemental bar code symbol is preceded by a normal EAN-13 bar code symbol. The bar code object contains both the EAN-13 symbol and the five-digit supplemental symbol. A check digit is generated from the five-digit supplemental data. The check digit is used to assign the bar and space patterns from number sets A and B. The check digit is not encoded or interpreted.

Type	Bar Code Type	Mod	Description
X'18'	POSTNET		USPS Specification
			For all POSTNET modifiers that follow, the BSA HRI flag field and the BSD module width, element height, height multiplier, and wide-to-narrow ratio fields are not applicable to the POSTNET bar code symbology. These fields are ignored because the POSTNET symbology defines specific values for these parameters.
		X'00'	Print a POSTNET ZIP Code bar code symbol.
		X'01'	Print a POSTNET ZIP+4 (delivery point) bar code symbol.
		X'02'	Print a POSTNET Advance Bar Code (ABC) bar code symbol.
		X'03'	Print a POSTNET variable-length bar code symbol. The bar code symbol is generated without length checking; the symbol is not guaranteed to be scannable or interpretable. The bar code consists of a leading frame bar, the encoded data, a correction digit, and a trailing frame bar.
		X'04'	PLANET Bar Code. Print a POSTNET PLANET bar code symbol. This is a "reverse topology" of POSTNET; tall bars are swapped with short bars.
X'1A'	RM4SCC (Royal Mail 4-State Customer Code)		A 4-state customer code defined by the Royal Mail Postal service of England for use in bar coding postal code information. This symbology is also called the Royal Mail bar code or the 4-State customer code. The symbology (as defined for modifier X'00') is used in the United Kingdom and in Singapore.
		'X'00'	Print an RM4SCC bar code symnbol with a printer generated start bit (start bar), checksum character, and a stop bit (stop bar). The start and stop bars identify not only the beginning and end of the bar code symbol, but also the orientation of the symbol. Input data is of variable length.
			The checksum algorithm is performed on the data characters only.
			The user is responsible for 2 mm quiet zone (all around) and proper sequencing of the Postal Code data (including International Prefix, Outward Code, Inward Code and Delivery Point Suffix).
X'1A'	RM4SCC (Dutch KIX Postal Bar Code)		This is a variation used in the Netherlands. KIX = KlantenIndeX = customer index.
		X'01'	Print a RM4SCC bar code symbol with NO start bar, NO checksum digit and NO stop bar. The checksum algorithm is performed on the data characters only.
			The user is responsible for 2 mm quiet zone (all around) and proper sequencing of the Postal Code data (including International Prefix, Outward Code, Inward Code and Delivery Point Suffix).

Type	Bar Code Type	Mod	Description
X'1B'	Japan Postal Bar Code		A bar code symbology defined by the Japanese Postal Service for use in bar coding postal code information.
		X'00'	Print a Japan Postal Bar Code symbol with a start character, checksum character and stop character. The generated bar code symbol will consist of a start code, a 7-digit new postal code, a 13-digit address indication number, a check digit, and a stop code.
		X'01'	Print a Japan Postal Bar Code symbol directly from the bar code data. Each valid character in the BSA data field is converted into a bar/space pattern with no validity or length checking. The printer will not generate start, stop, and check digits.
X'1F'	Australia Post Bar Code		A bar code symbology defined by Australia Post for use in Australian post systems. Start, stop, filler bar, and check digits are generated by the printer. Using any characters other than those prescribed for any part of the bar code will result in a NACK.
		X'01'	Standard Customer Barcode (format code = 11). An 8-digit number representing the Sorting Code. - Modifiers X'02' to and including X'07' are built up in two parts: the Sorting Code and Customer Information. The Customer Information follows the Sorting Code. The Sorting Code is always 8 digits (valid characters are 0-9).
		X'02'	Customer Barcode 2 using the N encoding table (format code = 59). Customer Information is represented by up to 8 digits (0-9).
		X'03'	Customer Barcode 2 using the C encoding table (format code = 59). Customer Information is represented by up to 5 characters (A-Z, a-z, 0-9, space, #).
		X'04'	Customer Barcode 2 using proprietary encoding (format code = 59). Customer Information is represented by up to 16 digits (numeric 0-3), each of which specifies one of the four types of bar.
		X'05'	Customer Barcode 3 using the N encoding table (format code = 62). Customer Information is represented by up to 15 digits (0-9).
		X'06'	Customer Barcode 3 using the C encoding table (format code = 62). Customer Information is represented by up to 10 characters (A-Z, a-z, 0-9, space, #).
		X'07'	Customer Barcode 3 using proprietary encoding (format code = 62). Customer Information is represented by up to 31 digits (numeric 0-3), each of which specifies one of the four types of bar. -
		X'08'	Reply Paid Barcode (format code = 45). 8-digits (0-9) number representing the Sorting Code.
X'21'	Code 93		The Standard Code 93 character set and Extended Code 93 character set are supported. Code 93 is supported on printers with IPDS code level 2.30-00550 and above.
		X'00'	Generate check digit and print it with the bar code.

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Type	Bar Code Type	Mod	Description
X'22'	USPS Four-State Bar Code		United States Postal Service Four-State bar code (also called OneCode^{SOLUTION} bar code). This symbology limits the symbol size. Human-Readable Interpretation (HRI) can be printed with a USPS Four-State symbol, but HRI is not used with all types of special services.
		X'00	Present a USPS Four-State bar code symbol with no Routing ZIP Code. The input data for this bar code symbol must be 20 numeric digits.
		X'01	Present a USPS Four-State bar code symbol with a 5-digit Routing ZIP Code. The input data for this bar code symbol must be 25 numeric digits; the valid values for the Routing ZIP Code are 00000-99999.
		X'02	Present a USPS Four-State bar code symbol with a 9-digit Routing ZIP Code. The input data for this bar code symbol must be 29 numeric digits; the valid values for the Routing ZIP Code are 000000000-999999999.
		X'03	Present a USPS Four-State bar code symbol with a 9-digit Routing ZIP Code. The input data for this bar code symbol must be 29 numeric digits; the valid values for the Routing ZIP Code are 000000000-999999999.

2D Bar Codes

Two-dimensional (2D) bar codes (sometimes called matrix symbologies) allow large amounts of data to be encoded in a small area. The information is represented in a two-dimensional matrix. The printer supports three 2D bar code symbologies as shown in the table below.

Column Labels:

Type = Value for Bar Code Type (Bar Code Symbol Descriptor Byte 12; Bar Code Data Descriptor Byte 16)

Mod = Modifier Value (Bar Code Symbol Descriptor Byte 13; Bar code Data Descriptor Byte 17)

Type	Bar Code Type	Mod	Description
1C	Data Matrix	00	Print a Data Matrix bar code symbol using error checking and correcting algorithm 200 as defined in the AIM International Symbology Specification – Data Matrix.
1D	Maxicode	00	Print a Maxicode bar code symbol as defined in the AIM International Symbology Specification – Maxicode.
1E	PDF417		PDF417 bar code as defined in the AIM International Symbology Specification – PDF417.
		00	Print a full PDF417 bar code symbol.
		01	Print a truncated PDF417 bar code symbol. The right row indicator is not printed and the stop pattern is printed in a single module width bar. For use in a relatively clean environment where risk of damage to the bar code is minimal.
20	QR Code	02	Print a Model 2 QR Bar Code symbol as defined in AIM International Symbology Specification – QR Code.

The printer supports several additional parameters defined for printing bar codes in the IPDS data stream. These parameters are described in the following sections. Additional information on these parameters may be found in the "Bar Code Object Content Architecture (BCOCA) Reference" (IBM publication S544-3766-05).

Acknowledgements

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Data Matrix Special Function Parameter Support (2D Barcodes)

These values are found in the Bar Code Symbol Data. A description of the supported values may be found in the "Bar Code Object Content Architecture (BCOCA) Reference" (IBM publication S544-3766-05).

Offset	Name	Supported Values
Byte 5 Bit 0	EBCDIC	B'0', B'1'
Byte 5 Bit 1	Escape Sequence Handling	B'0', B'1'

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Bytes 6-7	Desired Row Size	X'0000', See table below for supported row sizes.
Bytes 8-9	Desired Number of Rows	X'0000', See table below for supported number of rows.
Byte 10	Sequence Indicator	X'00' – X'10'
Byte 11	Total Symbols	X'00', X'02' – X'10'
Byte 12	File ID First Byte	X'01' – X'FE'
Byte 13	File ID Second Byte	X'01' – X'FE'
Byte 14 Bit 0	UCC/EAN FNC1	B'0', B'1'
Byte 14 Bit 1	Industry FNC1	B'0', B'1'
Byte 14 Bit 2	Reader Programming	B'0', B'1'
Byte 14 Bit 3	HDR/TRL Macro	B'00', B'01', B'10', B'11'

Supported Sizes for a Data Matrix Symbol							
Square Symbols				**Rectangular Symbols**			
Symbol Size		**Data Region**		**Symbol Size**		**Data Region**	
Number of Rows	Row size	Size	Number	Number of Rows	Row size	Size	Number
10	10	8x8	1	8	18	6x16	1
12	12	10x10	1	8	32	6x14	2
14	14	12x12	1	12	26	10x24	1
16	16	14X14	1	12	36	10x16	2
18	18	16x16	1	16	36	14x16	2
20	20	18x18	1	16	48	14x22	2
22	22	20x20	1				
24	24	22x22	1				
26	26	24x24	1				
32	32	14x14	4				
36	36	16x16	4				
40	40	18x18	4				
44	44	20x20	4				
48	48	22x22	4				
52	52	24x24	4				
64	64	14x14	16				
72	72	16x16	16				
80	80	18x18	16				

Supported Sizes for a Data Matrix Symbol							
Square Symbols				Rectangular Symbols			
Symbol Size		Data Region		Symbol Size		Data Region	
Number of Rows	Row size	Size	Number	Number of Rows	Row size	Size	Number
88	88	20x20	16				
96	96	22x22	16				
104	104	24x24	16				
120	120	18x18	36				
132	132	20x20	36				
144	144	22x22	36				

Maxicode Special Function Parameter Support (2D Barcodes)

These values are found in the Bar Code Symbol Data. A description of the supported values may be found in the "Bar Code Object Content Architecture (BCOCA) Reference" (IBM publication S544-3766-05).

Offset	Name	Supported Values
Byte 5 Bit 0	EBCDIC	B'0', B'1'
Byte 5 Bit 1	Escape Sequence Handling	B'0', B'1'
Byte 6	Symbol Mode	X'02' – X'05'
Byte 7	Sequence Indicator	X'00' – X'08'
Byte 8	Total Symbols	X'00', X'02' – X'08'
Byte 9 Bit 0	Zipper	B'0', B'1'

PDF417 Special Function Parameter Support (2D Barcodes)

These values are found in the Bar Code Symbol Data. A description of the supported values may be found in the "Bar Code Object Content Architecture (BCOCA) Reference" (IBM publication S544-3766-05).

Offset	Name	Supported Values
Byte 5 Bit 0	EBCDIC	B'0', B'1'
Byte 5 Bit 1	Escape Sequence Handling	B'0', B'1'
Byte 6	Data Symbols	X'01' – X'1E'
Byte 7	Rows	X'03' – X'5A', X'FF'
Byte 8	Security	X'00' – X'08'

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| Byte 9 – 10 | Macro Length | X'0000' – X'7FED' |
| Byte 11 | Macro Data | Values as defined in IBM BCOCA Reference Version 4. |

QR Code (Quick Response Code) (2D Barcodes)

These values are found in the Bar Code Symbol Data. A description of the supported values may be found in the "Bar Code Object Content Architecture (BCOCA) Reference" (IBM publication S544-3766-05).

Offset	**Name**	**Supported Values**
Byte 5 Bit 0	EBCDIC	B'0', B'1'
Byte 5 Bit 1	Escape Sequence Handling	B'0', B'1'
Byte 6	EBCDIC code page	X'00' – X'03'
Byte 7	Version	X'00, X'01 – X'28'
Byte 8	Error correction level	X'00' – X'03'
Byte 9	Sequence indicator	X'00' – X'10'
Byte 10	Total symbols	X'00' or X'02' – X'10'
Byte 11	Parity Data	X'00' – X'FF'
Byte 12 Bit 0	UCC/EAN FNC1	B'0', B'1' see below
Byte 12 Bit 1	Industry FNC1	B'0', B'1' see below
Byte 13	Application indicator	dependent on Byte 12, (special-function flags) see below

Byte 12 Bit 0 and 1, special-function flags

The special-function flags in Byte 12 specify special functions that can be used with a QR Code symbol. Bits 0 and 1 are alternate data type identifiers. Exception condition EC-0F11 exists if an incompatible combination of the two bits in Byte 12 is specified.

> Byte 12 Bit 0 UCC/EAN FNC1:
>
> If this flag is B'1', this QR Code symbol will indicate that it conforms to the UCC/EAN application identifiers standard. Byte 12 Bit 1 must be B'0'.
>
> Byte 12 Bit 1 Industry FNC1
>
> If this flag is B'1', this QR Code symbol will indicate that it conforms to the specific industry or application specifications previously agreed with AIM International. An application indicator must be specified in Byte 13. Byte 12 Bit 0 must be B'0'.

Byte 13, Application indicator for Industry FNC1

> When the Industry FNC1 flag (Byte 12, Bit 1) is B'1', this parameter specifies an application indicator.
>
> When the Industry FNC1 flag is B'0', this parameter is ignored and should be set to X'00'. Exception condition EC-0F12 exists if an invalid application-indicator value is specified.

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